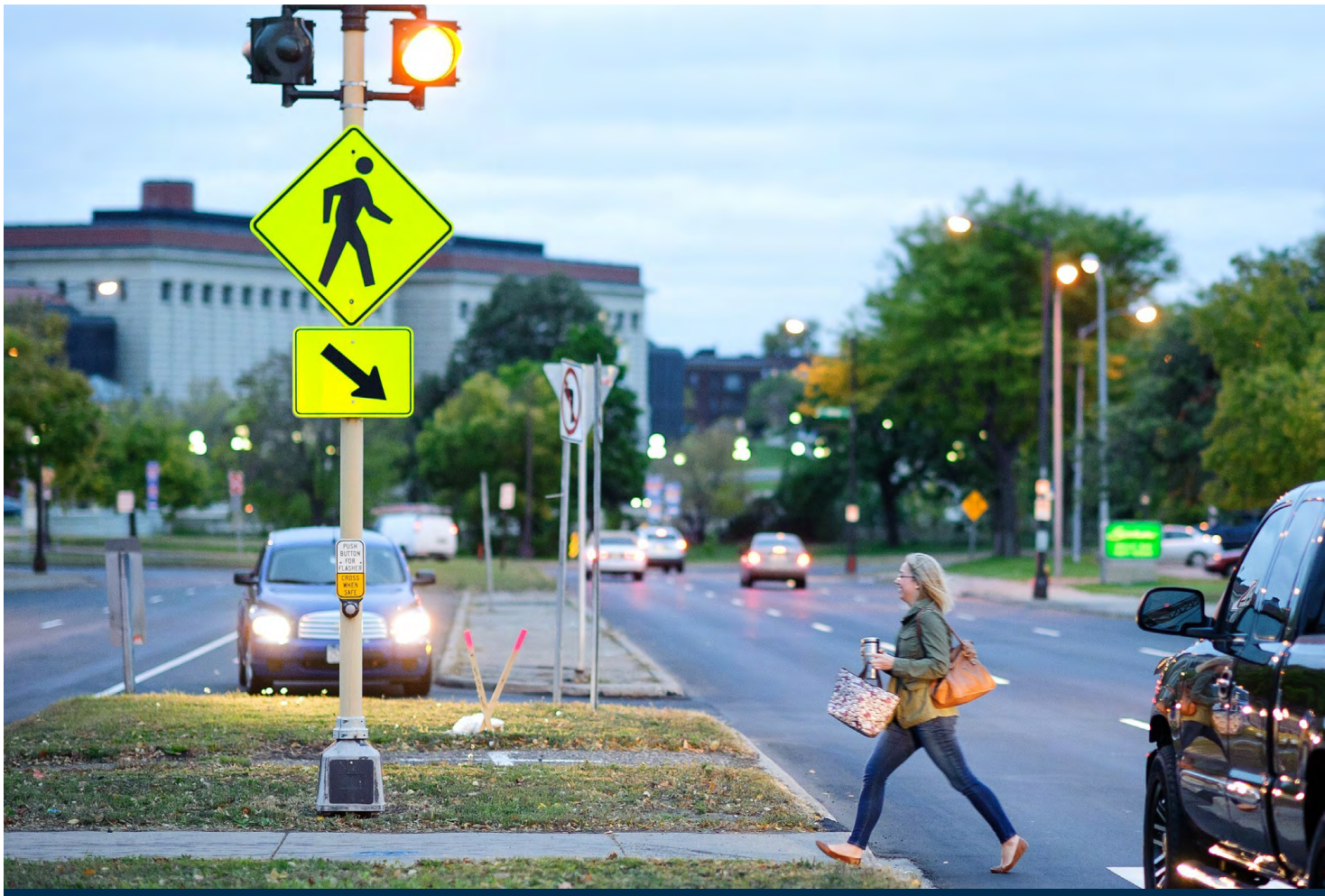
RESEARCH SUMMARY

NOVEMBER 2023



Understanding Factors That Influence Driver Yielding to Pedestrians

Vehicle speeds, type of pedestrian, road characteristics and other variables can impact whether drivers yield to pedestrians attempting to cross a road at an unsignalized intersection. An analysis of data collected from 18 intersections identified human and site attributes that correlate to higher rates of driver yielding. Knowledge of these potentially influential factors will help local engineers build safer crossings at intersections.

What Was the Need?

At road crossing areas without traffic signals, rates of drivers stopping for pedestrians vary. While yielding to people crossing at unsignalized intersections is legally required in Minnesota, numerous factors appear to influence whether a driver gives pedestrians the right of way, such as driving speed, time of day, lighting, land use context and other site-specific factors.

Not all roads or all locations at roads are conducive to safe pedestrian crossings. At intersections where pedestrians typically cross, however, local engineers wanted to understand how to enhance safety. Identifying risk factors for nonyielding behavior and characteristics that may encourage greater yielding could support Local Road Research Board measures to retrofit or construct safe intersections.

"These results confirmed that there are steps we can take to increase the likelihood that drivers will yield to pedestrians—a measure we use as a proxy for safety. The most effective interventions likely involve a combination of factors."

—HANNAH PRITCHARD, PRINCIPAL PEDESTRIAN AND BICYCLE ENGINEER, MnDOT OFFICE OF TRANSIT AND ACTIVE TRANSPORTATION

What Did We Do?

Previous research explored the influence of various factors on driver yielding rates. Event-based features include pedestrians, the presence of small children, the size of the group, vehicle characteristics, time of day and weather conditions. Site features include posted speed limit, number of lanes and safety treatments such as signs and crosswalk markings. After reviewing the literature, researchers worked with the Technical Advisory Panel to choose intersection sites representing a variety of site conditions to observe pedestrian crossings.

Naturalistic data—where events or behaviors are observed and recorded in real-world settings—was collected at 18 intersections in the Twin Cities area and Northfield. Comparing sites with a range of yielding rates would be ideal to identify explanatory factors, but choosing sites with the right balance of pedestrians and traffic was challenging. Investigators sought sites with enough pedestrian activity for sufficient data collection but not an atypical pedestrian volume, such as an outdoor mall or college campus.

For approximately two weeks at each site, traffic information monitors from the Minnesota Traffic Observatory captured video data from over 3,300 crossing events as investigators collected relevant intersection characteristics and other observational notes. The video footage illustrated pedestrian traits (such as party size or those who had a dog, stroller or small child), vehicle type, the state of oncoming traffic and the number of vehicles until a driver yielded.

Computer vision technology enabled the extraction of vehicle speeds from the video. A statistical analysis of the data identified correlations between site- or event-specific factors and driver yielding rates.

What Did We Learn?

The research produced several conclusions, though investigators noted that the correlations observed should not imply causation. Numerous factors, including many not considered in this project, likely influence driver yielding behavior. The analysis, however, revealed several factors that were present when observed yielding rates were higher.

Speed appeared to be the most significant variable, with speeds over 25 mph correlating to decreased yielding rates. The most significant influential site feature was crossing signs; drivers may be twice as likely to yield when signs are posted. Lower yielding rates were also noted on wider roads and multilane roads.

Areas with restaurants and parking lots correlated with higher yielding rates while lower yielding rates tended to be found in neighborhoods with multifamily housing.

The data contradicted an assumption common in both research and media reporting that many pedestrians involved in crashes tried to cross at the "wrong" time or place, or were otherwise at fault. Only 4% of pedestrians observed in the study began crossing before a sufficient vehicle gap, and over 34% waited to cross even after a gap in traffic.

What's Next?

Many factors identified in this study as correlating to higher driver yielding rates are beyond the control of transportation agencies. Yet knowing their impacts can guide designs. Results are being disseminated in Minnesota and may be included in the **Traffic Engineering Manual** and other guidance for local agency engineers.

About This Project

REPORT 2023-24
"Guidelines for Safer Pedestrian Crossings: Understanding the Factors That Positively Influence Vehicle Yielding to Pedestrians at Unsignalized Intersections." Find it at mdl.mndot.gov.

CONTACT
research.dot@state.mn.us.

TECHNICAL LIAISON
Hannah Pritchard, MnDOT, Hannah.Pritchard@state.mn.us

INVESTIGATOR
Raphael Stern, University of Minnesota, RStern@umn.edu

LRRB PROJECT COST
$82,638

TOTAL PROJECT COST
$165,278

www.mndot.gov/research